United States Department of the Interior

FISH AND WILDLIFE SERVICE
Mountain-Prairie Region

IN REPLY REFER TO:
FWS/R6
ES
Sicklefin Chub
Sturgeon Chub
12-month Finding

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U.S. FISH & WILDLIFE SER. ECOLOGICAL SERVICES APR 16 01

Memorandum

To: Director (AES)

From: Regional Director, Region 6

Subject: 12-Month Administrative Finding for the Petition to List the Sicklefin Chub (*Macrhybopsis meeki*) and the Sturgeon Chub (*Macrhybopsis gelida*) as Endangered

The "Updated Status Review of Sicklefin and Sturgeon Chub in the United States" is attached for your review and concurrence. Based on the best available data, we have concluded that the sicklefin chub and the sturgeon chub are not likely to become threatened or endangered in the foreseeable future throughout all or a significant portion of their ranges. Therefore, listing these species under the provisions of the Endangered Species Act (ESA) is not warranted at this time.

The sicklefin and sturgeon chub are members of the Cyprinidae or minnow family and are endemic to the Missouri River basin and the Mississippi River downstream from the confluence with the Missouri River. Both of these species are highly adapted to living in free flowing rivers with high levels of turbidity. The construction and continuing operation of dams and reservoirs on the main stem Missouri River and channelization of the Lower Missouri and Mississippi Rivers are the principal factors impacting sicklefin and sturgeon chub and their habitat. The dams and reservoirs have impacted chub habitat by inundating riverine habitat and altering flow regimes, turbidity levels, and water temperature. Based on the best information available, the Fish and Wildlife Service estimates that sicklefin chub currently occupies approximately 54 percent of its historic range in the Missouri River basin. We estimate that the sturgeon chub are currently found in about 55 percent of their historic range in the Missouri River. Recent studies indicate that viable populations of sicklefin and sturgeon chub are present in the Mississippi River downstream from the mouth of the Missouri River. Sturgeon chub also are found in 11 of 30 tributaries to the Yellowstone and Missouri River where they have been historically collected. Although there are threats influencing sicklefin and sturgeon chub populations, they are not of sufficient magnitude across the range of these species to warrant listing at this time.

BACKGROUND

On June 29, 1994, the Service received a petition from a coalition of groups to list the sicklefin and sturgeon chub as endangered throughout their range in accordance with the provisions of the ESA. The petitioners include American Rivers, Environmental Defense Fund, Mni Sose Intertribal Water Rights Coalition, National Audubon Society, and the Nebraska Audubon Council.

The petitioners assert that historically sicklefin chub and sturgeon chub populations inhabited a substantial portion of the Missouri River, its larger tributaries, and the Mississippi River downstream from the confluence with the Missouri River. They indicated that the historic range of sicklefin and sturgeon chub included waters in or bordering 13 and 14 states, respectively.

The petitioners indicate that sicklefin and sturgeon chub have physically adapted through evolution to inhabit turbid, swift flowing rivers. The petitioners assert that the impoundment and channelization of the Missouri River have drastically altered the natural habitat of the chubs by altering the natural hydrograph and reducing water temperature and turbidity levels. The petitioners also contend that aquatic insect larvae are the primary food source for these species. They believe the removal of snags from the Missouri River and dam construction have affected the range and abundance of aquatic insect larvae.

The petitioners conclude that the reduction of sicklefin chub and sturgeon chub habitat has severely impacted the species ability to survive. Transformation of the Missouri River has created colder, less turbid conditions which favor other Missouri River fish. The petitioners assert that the existing programs are not adequate to protect sicklefin and sturgeon chub populations. They believe listing these species as endangered will insure consultation under section 7 of the ESA for actions authorized, funded, or constructed by Federal agencies. The petitioners also indicated that scientists desperately need more information about both species and listing will place a higher priority on funding sicklefin and sturgeon chub research needs.

STATUS REVIEW

On January 18, 1995, the Service published a positive 90-day finding for both species in the Federal Register indicating that the petitioned action may be warranted. At that time, the Service requested public comments on the 90-day finding and any available information on the status of the species. The Service established a status assessment team, consisting of biologists from Regions 3,4, and 6, to gather information documenting sicklefin chub and sturgeon chub populations and determine whether listing these species as threatened or endangered under the ESA was warranted. A draft 12-month finding was completed in August 1995 and subsequently revised in 1997, 1999, and 2000 to include substantial new information. The Montana Rivers Coalition filed a 60-day notice of intent to sue the Secretary of the Department of the Interior on April 6, 2000, for the Service's failure to act on the petition in the time frames established by the ESA. The Montana Rivers Coalition's action resulted in a settlement agreement in which the Service agreed to submit the 12-month finding for the sicklefin and sturgeon chub for publication in the Federal Register on or before April 12, 2001.

The Service has received information concerning the status of sicklefin and sturgeon chub populations from State game and fish departments, the U.S. Bureau of Reclamation, U.S. Geological Survey, tribal representatives, universities, and other organizations and individuals.

The Service also reviewed information on the sicklefin and sturgeon chub from peer-reviewed journal articles, agency reports and file documents, telephone interviews and written correspondence with fisheries biologists familiar with these species.

The Service found that historic collection data documenting sicklefin and sturgeon chub populations are limited and provide an incomplete picture of their range and population levels. Both species received little attention from fishery biologists until recent years.

SICKLEFIN CHUB STATUS SUMMARY

Since 1993, when the Service completed a Sicklefin Chub Status Report (U.S. Fish and Wildlife Service 1993a), surveys have been conducted throughout most of this species' historic range. These studies indicate that sicklefin chub are more widely distributed and more common than previously believed. The efficiency of sampling techniques have dramatically improved with the use of benthic trawls that have been modified to collect small fish. Benthic trawls have permitted sampling in deep water habitats where seines, the traditional cyprinid collection method, are ineffective or can not be used.

Based on the existing collection records for sicklefin chub, the Service estimates that this species historically occurred in approximately 85 miles of the Lower Yellowstone River, approximately 1,950 miles of the main stem Missouri River, and about 1,150 miles of the Mississippi River, below the mouth of the Missouri River. We estimate that sicklefin chub currently occupy approximately 1,110 miles in the Missouri River drainage or about 54 percent of its historic range.

Information documenting the presence of sicklefin chub in the Mississippi River is limited by comparison to the Missouri River data set. Field studies conducted by the Missouri Department of Conservation since 1997 have documented viable populations of sicklefin chub in the Middle Mississippi River and in the Wolf Island area of the Lower Mississippi River. Historic collections of sicklefin chub in the Lower Mississippi River below Wolf Island are rare and generally document the presence of an individual fish. Sufficient data does not exist to determine if the Lower Mississippi River provided important habitat for sicklefin chub.

Recent studies using benthic trawls indicate that sicklefin chub comprise a significant part of the fish population at three locations in the Missouri River drainage: above Fort Peck Reservoir in Montana; the Yellowstone/Missouri River confluence area in North Dakota and Montana; and the lower Missouri River in Missouri. Grisak (1996) used both seines and a benthic trawl to sample the fish population in the Missouri River above Fort Peck Reservoir in 1994 and 1995. He found sicklefin chubs comprised 21.9 percent of the benthic trawl catch and only 0.08 percent of the catch with seines. Sicklefin chubs were the second most common species collected in benthic trawl tows. In 1999 and 2000, Gardner (2000a,b) sampled the same general area as Grisak. The sicklefin chub was the most common species collected in 1999 (41.5 percent of the catch) and the third most common species collected in 2000 (5.1 percent of the catch). Welker (2000) used both seines to sample shallow border channel habitat and a benthic trawl to sample deep water habitat in the Yellowstone/Missouri River confluence area in 1997 and 1998. Sicklefin chubs were the most common species collected in benthic trawl tows, comprising 33.2 percent of the trawl catch. By contrast, only 12 sicklefin chub were collected in seine hauls (0.005 percent of the catch using seines). Liebelt (in litt. 1999) sampled the Missouri River above the headwaters of Lake Sakakawea in 1999. Sicklefin chubs were the third most common

species collected, making up 8.6 percent of the catch. Grady and Milligan (1998) sampled the Missouri River in Missouri in 1997. They collected 3,934 fish in seine hauls, including one sicklefin chub. By contrast, sicklefin chubs were the second most common species collected with a benthic trawl (8.4 percent of the catch).

STURGEON CHUB STATUS SUMMARY

The Service estimates the sturgeon chub historically occurred in approximately 2,100 miles of the main stem Missouri River and about 1,150 miles of the main stem Mississippi River. The species was also found in the Yellowstone River in Montana and North Dakota and 30 tributaries to the Yellowstone and Missouri Rivers. The sturgeon chub occurred in portions of four tributaries in Wyoming, nine in Montana, five in North Dakota, six in South Dakota, six in Nebraska, and four in Kansas. Tributaries such as the Powder River, which provides sturgeon chub habitat in both Wyoming and Montana, are included in the tallies for both states. Other tributaries that historically provided sturgeon in two states include the Big Horn, Little Missouri, and Republican Rivers.

Sturgeon chub currently occupy approximately 1,155 miles or about 55 percent of its historic range in the Missouri River. The species also continues to be found in 11 of 30 tributaries to the Yellowstone and Missouri Rivers that have been documented as providing sturgeon chub habitat. Like the sicklefin chub, information documenting sturgeon chub populations in the Mississippi River is limited by comparison to the Missouri River data set. Field studies conducted by the Missouri Department of Conservation since 1997 indicate a viable population of sturgeon chub exists in the Middle Mississippi River and in the Wolf Island area of the Lower Mississippi River (Hrabik and Herzog 2000 in litt. a,b). Historic collections of sturgeon chub below Wolf Island are rare and do not provide adequate information to assess if this area historically provided important sturgeon chub habitat.

The distribution of sturgeon chub in the main stem Missouri and Mississippi Rivers is similar to that of the sicklefin chub. Both species are highly adapted for conditions found in free-flowing rivers with high turbidity levels in the main channel. Like the sicklefin chub, sturgeon chub comprise a significant portion of the Missouri River fish community above Fort Peck Reservoir in Montana, in the Yellowstone/Missouri River confluence area in Montana and North Dakota, and in the Lower Missouri River in Missouri.

Recent studies using benthic trawls designed to collect small fish from deep water areas of the main channel have provided new information about the distribution and relative abundance of sturgeon chub. Grisak (1996) conducted the first studies using a benthic trawl with small mesh netting to specifically collect cyprinids and other small fish in the Missouri River. He sampled the Missouri River above Fort Peck Reservoir in 1994 and 1995 and found that sturgeon chub comprised 18.9 percent of the benthic trawl catch compared to only 0.16 percent of the catch with seines. In Grisak's study, sturgeon chub were the third most common species collected in benthic trawl tows. In 1999 and 2000, Gardner (1999, 2000) sampled the same general area as Grisak. Gardner collected 218 sturgeon chub (16.1 percent of the catch) in August 1999 and 145 sturgeon chub (32.0 percent of the catch) in August 2000 using a benthic trawl. Welker (2000) used both seines and a benthic trawl to sample the fish population in the Yellowstone/Missouri River confluence area in North Dakota. Sturgeon chub were the second most common species collected (32.3 percent of the catch) in benthic trawl samples taken in the main channel. Shallow border channel areas were also sampled with seines. Sturgeon chubs

were rare in seine samples, representing less than 0.01 percent of the catch. Liebelt (in litt.1999) sampled a reach of the Missouri River from Williston, North Dakota, downstream to the headwaters of Lake Sakakawea in August 1999. Sturgeon chubs were the second most common species collected, representing 11.1 percent of the catch in benthic trawl tows. In Missouri, Grady and Milligan (1998) sampled the Lower Missouri River in 1997. They collected 3,934 fish with seines, however no sturgeon chub were captured. Sturgeon chub ranked fourth in abundance for fish collected in benthic trawl tows (4.1 percent of the catch).

FINDINGS AND CONCLUSIONS

The Service has compiled and analyzed the best available data on sicklefin and sturgeon chub populations throughout their range. We found that sicklefin and sturgeon chub are highly adapted for conditions found in turbid, free-flowing river systems. The historic range of the sicklefin chub included the Lower Yellowstone River, the Missouri River, and the Mississippi River below the confluence with the Missouri River. The range of the sturgeon chub overlapped that of the sicklefin chub. Sturgeon chub also have been historically collected in 30 tributaries to the Yellowstone and Missouri Rivers and ascended further upstream in the Yellowstone and Missouri Rivers than sicklefin chubs. We also found the literature documenting sicklefin and sturgeon chub provide an incomplete picture of population levels, range, habitat use, and biology. Information documenting chub conditions prior to the construction on the Missouri River main stem dams is limited to a few records documenting the presence of these species.

In 1993, the Service issued status reports for the sicklefin chub and sturgeon chub (U.S. Fish and Wildlife Service 1993a,b). The reports indicated the range and populations of sicklefin and sturgeon chub have been substantially reduced. In August 1994, the Service was petitioned to list the sicklefin and sturgeon chub as endangered. These actions helped to focus attention on two species that had been largely overlooked throughout much of their range. While major information gaps remain concerning feeding habits, reproduction, seasonal habitat use, and other aspects of sicklefin and sturgeon chub biology, substantially greater emphasis has been placed on documenting chub populations and their habitats during the past 7 years.

At the same time as the petition to list the sicklefin and sturgeon chub as endangered was filed, fishery biologists coincidentally modified the gear used to sample cyprinid populations. Until 1993, researchers primarily relied on seines to collect small fish in the Missouri and Mississippi Rivers. Seines allowed sampling in shallow water sandbar and border channel habitats, usually not exceeding 1.5 meters (4.9 feet) in depth. Grisak (1996) was the first to use a benthic trawl, modified to catch small fish, to characterize the fish population in a portion of the Missouri River. Grisak's work above Fort Peck Reservoir in Montana during 1994 and 1995 and the results of subsequent field investigations using benthic trawls have provided new information on the range and relative abundance of the sicklefin and sturgeon chub. He collected 5,095 fish, using seines to sample shallow water sites (0.19 to 0.86 meters - 0.6 to 2.8 feet). Sicklefin and sturgeon chub were rare in seine hauls, comprising 0.08 and 0.16 percent of the total catch, respectively. Sturgeon chub ranked 14th in abundance and sicklefin chub ranked 15th in seine hauls. In comparison, Grisak collected 302 sicklefin chub (21.9 percent of the catch) and 260 sturgeon chub (18.9 percent of the catch) using a benthic trawl. Sicklefin and sturgeon chub were the second and third most common species collected in benthic trawl tows. The mean depth at trawl sites where sicklefin chubs were collected was 3.41 m (11.2 ft).

Field studies conducted since the 1993 status reports were issued indicate that sicklefin chub and

sturgeon chub are more widespread and occur in greater numbers than previously believed. Researchers in Montana (Gardner 2000a,b), North Dakota (Liebelt, in litt. 1999, Everett 1999, Welker 2000), and Missouri (Grady and Milligan 1998, Hrabik and Herzog, in litt. 2000a,b) have collected substantially greater numbers of sicklefin and sturgeon chub using trawling techniques. Recently, new locations supporting sicklefin and sturgeon chub populations, such as the Wolf Island area of the Lower Mississippi River, have been identified.

While recent studies documenting sicklefin and sturgeon chub populations are encouraging, the range of these species has been substantially reduced. The major factors impacting sicklefin and sturgeon chub populations are the construction and continued operation of the six main stem dams on the Missouri River built by the Corps of Engineers as part of the Pick-Sloan Plan between 1937 and 1964, the loss of habitat associated with the Bank Stabilization and Navigation Project in the Middle and Lower Missouri River, and navigation projects on the Middle and Lower Mississippi River. The dams altered the physical and chemical elements of channel morphology, flow regime, water temperature, sediment transport, turbidity, and nutrient input that provided habitat for sicklefin chub, sturgeon chub, and other native fish species. Today, approximately 36 percent of the Missouri River's riverine habitat has been converted to reservoirs, 40 percent has been channelized, and the remaining 24 percent has been altered by changes in water temperature, turbidity levels, and flow conditions caused by dam operations. Sicklefin chub currently occupy approximately 54 percent of their historic range in the Missouri River basin. Sturgeon chub currently occur in about 55 percent of their historic range in the Missouri River. Sturgeon chub also occur in 11 of the 30 tributaries to the Yellowstone and Missouri Rivers where historic catch records exist. Viable populations of both species have also been recently documented in the Middle Mississippi River and the Wolf Island area of the Lower Mississippi River.

Sicklefin and sturgeon chub populations have been eliminated from over 800 miles of the Missouri River that has been impounded, and approximately 200 miles of inter-reservoir reaches between Garrison Dam in North Dakota and Gavins Point Dam in South Dakota. These species are also found in low numbers in the Middle Missouri River, below Gavins Point Dam to Rulo, Nebraska. However, the results of field investigations indicate viable, self-sustaining populations of sicklefin and sturgeon chub continue to occur in a portion of their historic range, despite the ongoing operations of water projects and other activities, while in other areas these species have been extirpated or exist in low numbers.

The ESA defines a "threatened species" as any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. An "endangered species" is defined as any species which is in danger of extinction throughout all or a significant portion of its range.

As mentioned previously, the principal factors impacting sicklefin and sturgeon chub populations are the construction and continuing operation of the dams on the main stem Missouri River and channelization of the Middle and Lower Missouri and Mississippi Rivers. Water depletion projects, impoundments, entrainment, and drought have impacted sturgeon chub populations in the Yellowstone River and tributaries to the Yellowstone and Missouri Rivers. The threats posed by the dams and reservoirs have been in place for over 35 years. Despite the loss of over 1,000 miles of suitable habitat in the Missouri River, viable, self-sustaining populations of sicklefin and sturgeon chubs occur where habitat conditions, flow patterns, and turbidity levels resemble conditions prior to the construction of the main stem dams.

Sicklefin and sturgeon chub are short-lived species, with a small percentage of their populations reaching age 4+. While little is known about sicklefin and sturgeon chub reproduction, these species have successfully propagated with the major identified threats in place since 1964, when the Big Bend Dam in South Dakota, the last major flood control component of the Pick Sloan Plan, was completed. Sicklefin and sturgeon chub have successfully reproduced under a variety of flow conditions in the Missouri River (including periods of extended drought and persistent high water levels) with the principal threats to the species in place.

A species may be determined to be threatened or endangered due to one or more of five factors described in Section 4(a)(1) of the ESA. The factors that must be evaluated to determine if a species warrants listing are- - (1) the present or threatened destruction, modification, or curtailment of the species' habitat or range; (2) overutilization for commercial, recreational, scientific, or educational purposes: (3) disease or predation; (4) the inadequacy of existing regulatory mechanisms; and (5) other natural or manmade factors affecting the species' continued existence. The decision concerning whether a species warrants listing requires an evaluation of past actions and activities that may occur in the foreseeable future that might affect the species. Although the range and distribution of sicklefin chub and sturgeon chub has been clearly reduced from historic levels and the extant populations face some potential threats that warrant continued monitoring, we do not believe that either the sicklefin chub or the sturgeon chub will become threatened or endangered in the foreseeable future with the type and magnitude of threats that exist today.

Three conservation actions, one that is being implemented and two that are currently in the planning stage, will benefit both sicklefin and sturgeon chub. Implementation and monitoring of the Missouri River Bank Stabilization and Navigation Project (BSNP) fish and wildlife mitigation plan is ongoing. The BSNP was established to create a navigable channel from Sioux City, Iowa to the mouth of the Missouri River near St. Louis (735 river miles). Originally authorized by the Rivers and Harbors Act of 1912 and officially completed in 1981, the project created one stabilized, self-sustaining channel from numerous small channels using revetments and transverse dikes. In 1986, Congress authorized mitigation for fish and wildlife habitat losses associated with the construction, operation, and maintenance of the BSNP in Nebraska, Iowa, Kansas, and Missouri. The project mitigation plan authorized the acquisition of 29,900 acres (12,109 hectares) and the development of an additional 18,200 ac (7,371 hectares) of existing public land. Recently, the mitigation plan was reauthorized as part of the Water Resources Development Act of 1999 and the acquisition ceiling was increased by 118,650 acres (48,053 hectares). Based on the conceptual plans that have been developed, State and Federal agencies anticipate the rehabilitation of aquatic and terrestrial habitats will benefit fish and wildlife resources, including the sicklefin and sturgeon chub.

In November 2000, the Service completed a biological opinion under Section 7 of the ESA on the Corps of Engineers' Operation of the Missouri River Main Stem System, the related operation of the Kansas River Tributary Reservoirs, and the Operation and Maintenance of the Missouri River Bank Stabilization and Navigation Projects (U.S. Fish and Wildlife Service 2000). The Service found that to avoid jeopardizing the continued existence of the pallid sturgeon, conservation measures to restore riverine and aquatic habitat and hydrologic conditions on segments of the Missouri River between Fort Peck Dam and the headwaters of Lake Sakakawea and below Gavins Point Dam are necessary. The emphasis of the Biological Opinion is to restore or rehabilitate enough of the Missouri River ecosystem to avoid jeopardizing the pallid sturgeon and other listed species. Implementation of the identified conservation measures

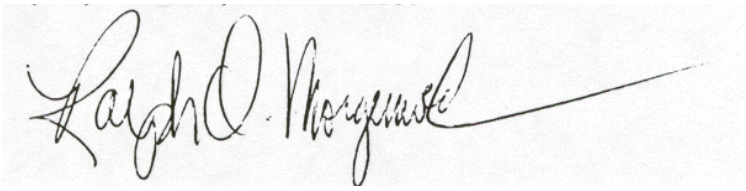
are expected to have a significant beneficial effect on sicklefin and sturgeon chub through habitat restoration and creation projects, improved water temperature regimes, and flow modifications designed to mimic the natural hydrograph. The Corps of Engineers is currently seeking public input on the Implementation Plan for the Reasonable and Prudent Alternative identified in the Biological Opinion.

The Service has also entered formal consultation under Section 7 of the ESA with Reclamation on plans to privatize and transfer the Intake Diversion Structure and lowhead dam to the Lower Yellowstone Irrigation District. Studies conducted at this structure projected that over 2,000,000 fish were entrained in the irrigation canal system during the 1996, 1997, and 1998 irrigation seasons. Reclamation estimated that over 289,000 ± 113,000 sturgeon chub were entrained during the 3- year study period. Reclamation is working with the Service and others to develop a design that allows for fish passage over the lowhead dam and minimizes entrainment losses. Implementation of "fish friendly" measures will benefit the sturgeon chub population in the Yellowstone River. Conservation measures developed for the Intake Diversion Structure and lowhead dam may be applicable at other water diversion sites on the Yellowstone River.

The Service remains concerned about the potential impacts associated with coalbed methane production in Wyoming and Montana and future water impoundment and depletion projects on the Yellowstone River, its tributaries, and tributaries to the Missouri River. Information documenting how coalbed methane products will affect water quality in tributaries such as the Powder River is not known at this time. Another potential threat to sicklefin and sturgeon chub populations is the presence of four species of Asian carp in the Mississippi River and the Missouri River below Gavins Point Dam. There is no data currently available to document that chubs are being impacted by invasive species. However, if Asian carp populations continue to expand, the diversity of species supported by the Missouri and Mississippi River ecosystems, including chubs, may be negatively impacted. The potential threats to the chubs associated with coalbed methane production, water impoundment and depletion projects, and invasive species warrant evaluation during project specific reviews and future status assessments for the sicklefin and sturgeon chub.

On the basis of the best available information, the Service concludes that neither the sicklefin chub and sturgeon chub are not likely to become threatened or endangered in the foreseeable future throughout all or a significant portion of their range. Therefore, listing either the sicklefin chub and the sturgeon chub is not warranted at this time.

A draft notice regarding this finding is attached for your review and publication in the Federal Register. The petitioners and the Montana River Coalition will be notified of our finding upon its publication. If further information is needed, please contact Bill Bicknell or Al Sapa at (701) 250-4481 or Chuck Davis at (303) 236-7400, Ext. 235.



Attachments

Approval K Adams Disapproval _____

Acting Deputy Director

Date 4-10-01 Date _____

REFERENCES

Everett, S.R. 1999. Life history and ecology of three native benthic fishes in the Missouri and Yellowstone Rivers. M.S. Thesis. University of Idaho, Moscow.

Gardner, W.M.. 2000a. Upper Missouri River Pallid Sturgeon Recovery Studies - 1999 Progress Report. Montana Department of Fish, Wildlife, and Parks. Lewistown.

Gardner. W.M. 2000b. Upper Missouri River Pallid Sturgeon Recovery Studies - 2000 Progress Report. Montana Department of Fish, Wildlife, and Parks. Lewistown.

Grady, J.M., and J. Milligan. 1998. Status of selected cyprinid species at historic Lower Missouri River sampling sites. U.S. Fish and Wildlife Service, Columbia, Missouri. 49 pp.

Grisak, G.G. 1996. The status and distribution of the sicklefin chub in the Middle Missouri River, Montana. M.S. Thesis, Montana State University, Bozeman. 77 pp.

Hrabik, Robert and David Herzog. in litt. 2000a. Missouri Department of Conservation, Open River Field Station, Jackson.

Hrabik, Robert and David Herzog, in litt. 2000b. Missouri Department of Conservation, Open River Field Station, Jackson.

Liebelt, James. in litt. 1999. Fisheries Biologist, Montana Department of Fish, Wildlife and Parks, Fort Peck.

U.S. Fish and Wildlife Service. 1993a. Status report on sicklefin chub (Macrhybopsis meeki), a candidate endangered species. U.S. Fish and Wildl. Serv., Bismarck, North Dakota. 41 pp.

U.S. Fish and Wildlife Service. 1993b. Status report on sturgeon chub (Macrhybopsis gelida), a candidate endangered species. U.S. Fish and Wildl. Serv., Bismarck, North Dakota. 58 pp.

U.S. Fish and Wildlife Service. 2000. Missouri River Biological Opinion. Denver, Colorado and Fort Snelling, Minnesota. 286 pp.

Welker, T.L. 2000. Ecology and structure of fish communities in the Missouri and Lower Yellowstone Rivers. PhD. Thesis, University of Idaho, Moscow. 232 pp.